

PATENT SPECIFICATION

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(54) DEVICE FOR CLAMPING ARTICLES ON MACHINE TOOLS

(71) We, VEREINIGTE FLUGTECHNISCHE WERKE-FOKKER G.M.B.H., of Hünefeldstrasse 1—5, 28 Bremen 1, Federal Republic of Germany, a German Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a device for clamping articles, e.g. workpieces, on a machine tool with a rotatable article mounting.

For clamping workpieces on such machine tools, such as turning machines and particularly carousel turning machines, faceplates with clamping dogs or faceplate jaws are usual, which are guided in long slots and are actuated predominantly by threaded spindles. Furthermore, it is usual to secure the workpieces directly on the faceplate jaw using conventional tightening screws and clamping shoes or to chuck them by means of a conventional chuck.

In this type of chucking there exists the disadvantage that particularly thin-walled components can be easily deformed by the clamping dogs, tightening screws and clamping shoes used. Furthermore, this chucking technology — insofar as the workpiece is not put directly on the rotary table or the faceplate — necessitates a chuck to be connected to the workpieces, the construction and production of which incurs considerable costs.

Now, in more recent times, a fixing and chucking system for workpieces to be machined on machine tools has become known (German Offenelegungsschrift No: 1 903 576) in which clamping plates equipped with fixing bores arranged in regular coordinate spacings are used. In this case chucking units are fixed positionally on these plates with bores arranged in the same

coordinate spacings, the workpiece to be machined being received by this chucking unit. The fixing is effected in this case by means of tight fit screws which engage in corresponding threads in the fixing bores.

A further development of this known fixing and chucking system (German Offenelegungsschrift No: 1 923 833 consists in that in addition to the fixing bores, bores leading to a distributed vacuum system are provided which lie in slots in connection with each other and serve for mounting seals. These seals are, in each case, inserted in the vicinity of the external edge of the component to be attached, so that the suction produced by the vacuum in each case is effective only in the area delimited by the seals and thus the components positionally determined by the tight fit screws or tight fit bolts are additionally or merely fixed by the suction. The other bores of the vacuum system in this case are blocked off with respect to the outside air.

This fixing and chucking system makes possible, with the help of a multiplicity of different re-usable chucking units, a very rapid and positionally accurate positioning and attachment of workpieces.

Moreover conventional chucking devices, connected to the workpieces, are no more necessary, since nearly all the workpieces can be accommodated by standardised reusable chucking units.

The present invention seems to provide an improvement on the above-described system.

According to the invention, there is provided a device for clamping an article on a machine tool with a rotatable mounting for said articles, said device comprising a work table provided with an array of fixing points for the attachment of chucking units and with a network of open conduits which are arranged to communicate with a vacuum source and which can ac-

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commodate selectively removable vacuum seals, wherein said fixing points are provided in one or more pairs of parallel rows radiating from a central location and wherein open conduits of said network extend parallel to said rows.

In a preferred embodiment of the invention, the said open conduits of said network are disposed one on each side of a row of fixing points. Preferably, the fixing points of each row are equally spaced.

The conduit network may be provided with other open conduits radiating from said central location and/or surrounding said central location. The said other open conduits surrounding the central location are preferably concentric.

The open conduits are desirably grooves or channels or slots formed in the said work table. The open conduits may, according to a preferred embodiment of the invention, have a T-shaped cross-section.

A bore is desirably provided at said central location, for the accommodation of centring elements.

Each of the fixing points may be constituted by a bore and each bore preferably comprises a screw-threaded part and a smooth wall part.

The invention will now be further described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a plan view of one embodiment of a device according to the invention;

Figure 2 shows a section taken along the line II—II in Figure 1 through a fixing bore and adjacent slots;

Figure 3 shows a section taken along the line III—III in Figure 1 through a point of intersection of a radial and an annular slot;

Figure 4 shows a section taken along the line IV—IV in Figure 1 through the centre of the work table;

Figure 5 shows a device according to the invention with a workpiece fixed by means of three chucking units;

Figure 6 is a plan view of another embodiment of a device according to the invention with a workpiece chucked through special chucking units; and

Figures 7 and 8 show a side view and a partial plan view respectively of a further embodiment of a device according to the invention.

In Figure 1, a round work table 1 is provided with fixing bores 5 arranged in rows 3 in regular spacings 4. The arrangement in this case is so contrived that, in each case, two rows 3 run parallel and symmetrically to radials 7, which in turn are distributed regularly over the work table 1. Further, the work table 1 is provided with a network of open conduits, which comprises slots 9 running parallel and symmetrically to

the rows 3, radial slots 11 running between the radials 7, and a plurality of concentric annular slots 13. The entire network is in connection with a vacuum source by means of closable bore (Figure 3) arranged on the appropriate points of intersection 15, 17.

In the centre of the work table 1 there is further arranged a bore 19 which serves for the accommodation of centring elements or chucking bodies.

Figure 2 shows a fixing bore 5, which is provided with a sleeve 501 which is a force fit in the bore 5 and a threaded part 502 and is flanked by two slots 9, the slot on the left being filled by a sealing strip 21 of circular cross-section.

In Figure 3 a bore 25, which leads to the suction channel 23, is located on the point of intersection of the radial slot 11 with the annular slot 13. This bore 25 is here closed by a sealing screw 27. If a suction is required in slots 11 and 13 in the region of the bore 25, the sealing screws 27 can be removed at any time to open the path from the suction channel 23 to the slots.

As Figure 4 shows, the bore 19 lies in the centre of the work table 1, has a larger diameter than say the fixing bore 5 and is formed in an appropriate manner by a hardened bush. A connecting piece 29 for the connection of the suction channel 23 and thus of the entire network, contained in the work table, to a vacuum source is located under the bore 19, likewise in the centre of the work table.

In Figure 5 a workpiece 31 to be machined is chucked on the work table 1 by chucking units 35, 37 and 39 which are fixed in the fixing bores 5 by means of screws 33. The chucking unit 35 in this case represents a so-called fixed point unit, which can be adjusted and locked by a threaded spindle 351, i.e. a unit with a truly controllable, but otherwise fixed, workpiece mounting pin 352. In contrast, in the case of the chucking unit 37 the workpiece mounting pin 372 is arranged on a slider 373 movable in one direction (here radial), so that here it is a so-called slider unit. Finally, the chucking unit 39 is a so-called crossover slider unit, provided with two sliders 393, 394, which unit permits movements of the workpiece mounting pin 392 in two coordinate directions. Because of the asymmetrical form of the workpiece 31 a weight 41 is provided for balancing the mass, which weight is likewise secured in the fixing bores 5.

In the case of the sliders 373, 393 and 394, the mobility is damped by guides, correspondingly difficult to move through, and/or by the use of the suction available in the entire region of the work table because of the slot network (not shown), so that length changes of the workpiece due to

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- warming or the inherent tensions being released during machining are allowed for although the workpiece remains immovably firmly chucked.
- In Figure 6 a circular-shaped workpiece 43 is chucked on the work table 1 by six chucking units 45, 47 positionally fixed by means of screws 33 in the bores 5. Each chucking unit is provided with a chucking jaw 51 arranged to engage the workpiece 43. Each chucking jaw 51 is connected to an end stop 511 by a pin 512 whereby the jaws are pivotally mounted.
- The two chucking units 45 are embodied as fixed point chucking units which are adjustable and lockable by means of a threaded spindle 451, with which units the swivel pins 512 and consequently the chucking jaws 51 can be brought and fixed into the desired radial position.
- The chucking units 47 are, in contrast, equipped with only sliding carriages 471 for the purposes of the appropriate matching to the workpiece, which carriages are chucked however in the position specified by the form of the workpiece by suction and can be arrested in the radial direction by an end stop provided in the pin 512, in order to counteract centrifugal force.
- The chucking jaws 51 are in connection with the slot network of the work table 1 by means of bores (not shown) and their surfaces facing the workpiece 43 are likewise in communication by a suitable slot network with the vacuum source (not shown).
- In Figures 7 and 8 a chucking body 53, connected to the component, is chucked on the work table 1 exclusively by suction. This body is formed to hold a partially spherical thin-walled workpiece 55 to be machined and is provided on its upper side with a slot network 57 as well as with suction bores 59 passing therethrough into the slot network 57 and which are in communication with the vacuum source by means of the slot network in the work table 1 (Figure 1) and the suction channel 23 (Figure 4). Since the penetration of outside air is prevented by sealing strips (similar to that shown in Figure 2) mounted between the chucking body 53 and the workpiece 55 in corresponding peripheral slots 61, the body 53 is thus rigidly chucked by the suction acting in the slot network of the work table 1 and simultaneously in the workpiece 55 by means of the suction bores 59 and the slot network 57.
- WHAT WE CLAIM IS:**
1. A device for clamping an article on a machine tool with a rotatable mounting for said articles, said device comprising a work table provided with an array of fixing points for the attachment of chucking units and with a network of open conduits which are arranged to communicate with a vacuum source and which can accommodate selectively removable vacuum seals, wherein said fixing points are provided in one or more pairs of parallel rows radiating from a central location and wherein open conduits of said network extend parallel to said rows.
2. A device according to Claim 1, wherein said open conduits of said network are disposed one on each side of a row of fixing points.
3. A device according to Claim 1 or Claim 2, wherein the fixing points of each row are equally spaced.
4. A device according to any preceding claim, wherein said conduit network is provided with other open conduits radiating from said central location.
5. A device according to any preceding claim, wherein said conduit network is provided with further open conduits surrounding said central location.
6. A device according to Claim 5, wherein the said further open conduits surrounding said central location are concentric.
7. A device according to any preceding claim wherein said open conduits are grooves or channels or slots formed in said work table.
8. A device according to Claim 7 and either one of Claims 5 or 6, wherein said further open conduits are of T-shaped cross-section.
9. A device according to any preceding claim, wherein a bore is provided at said central location for the accommodation of centring elements.
10. A device according to any preceding claim, wherein each of said fixing points is constituted by a bore.
11. A device according to claim 10, wherein each bore comprises a screw-threaded part and a smooth wall part.
12. A device substantially as herein described with reference to the accompanying drawings.

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Reference has been directed in pursuance of Section 9, Subsection (1) of the Patents Act 1949, to patent No. 1,315,692.

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 the Original on a reduced scale
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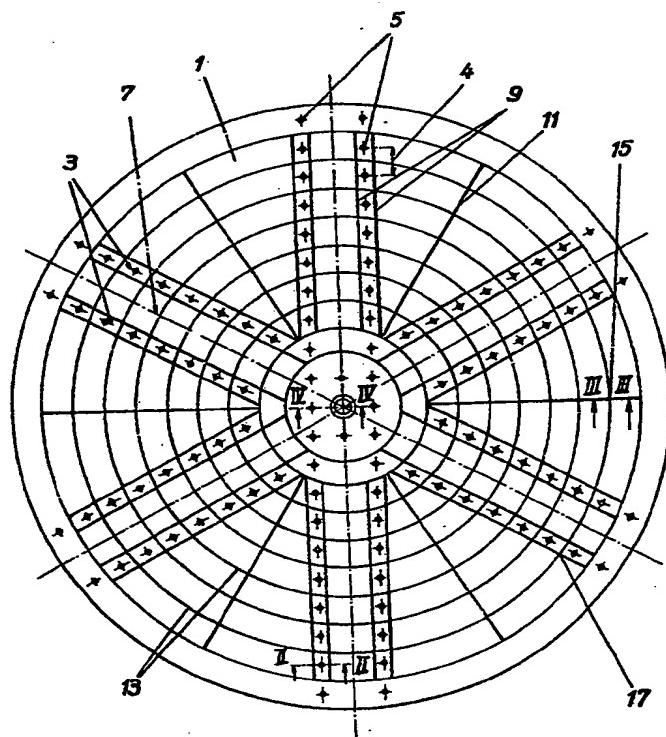


Fig. 1

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 Sheet 2

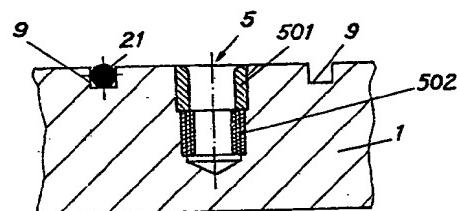


Fig. 2

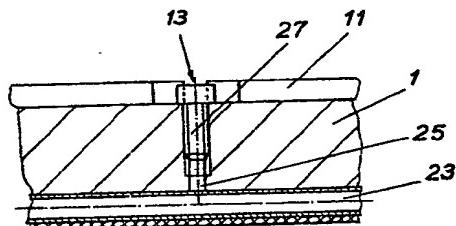


Fig. 3

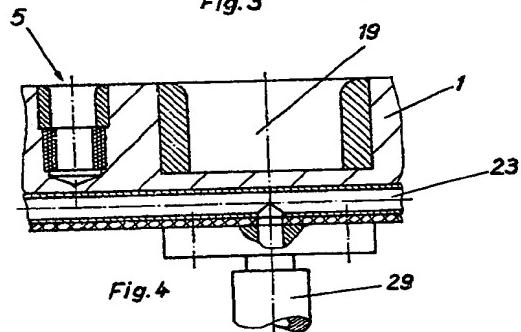


Fig. 4

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Sheet 3

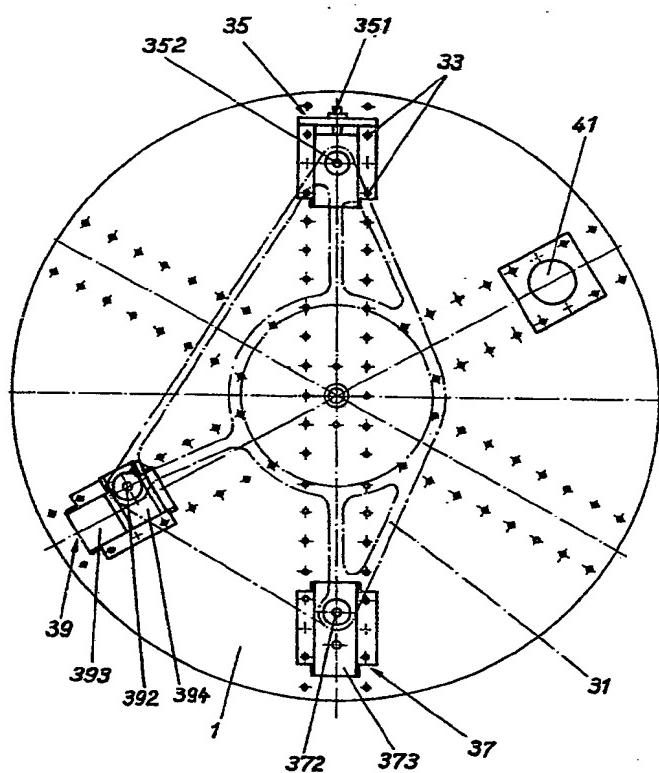


Fig. 5

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Sheet 4

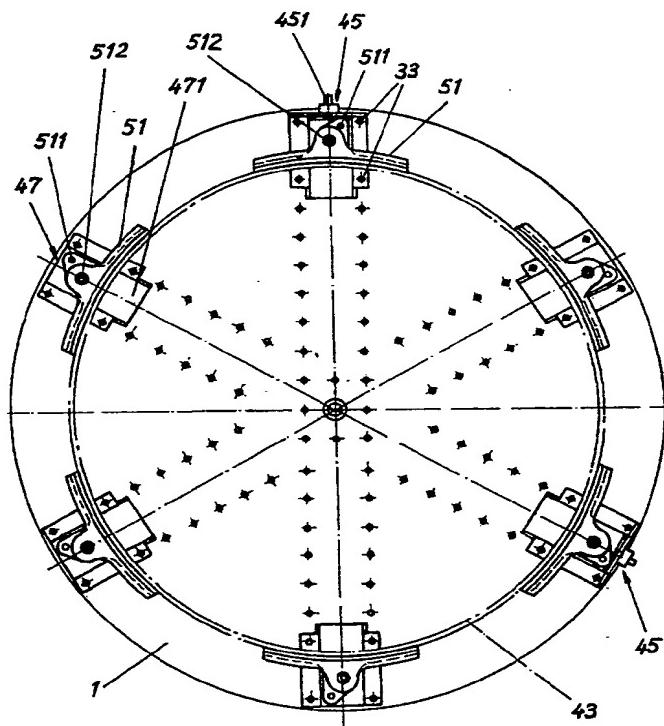


Fig.6

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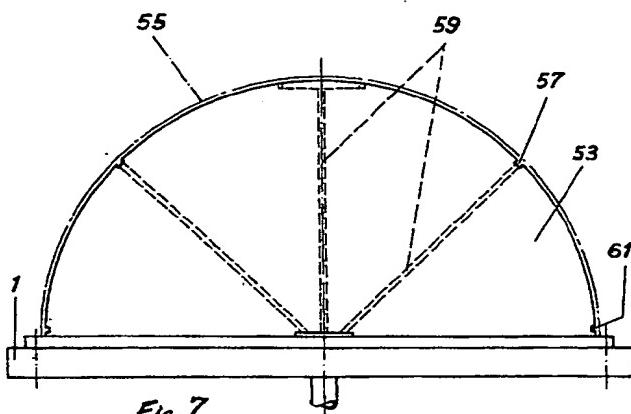


Fig. 7

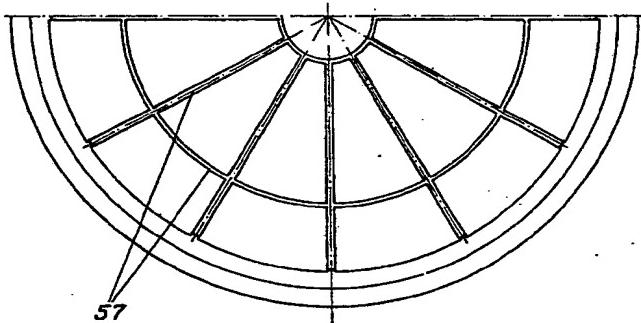


Fig. 8